Data Science for Operations & Planning at Durham Public Schools
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Project Overview
Durham Public Schools (DPS) is implementing a new assignment plan for students K-12 through its Growing Together initiative. This initiative aims to:
- Redraw appropriate school boundaries and change school choice requirements.
- Improve diversity and equity in public schools across the county.
To enact such changes, DPS need data on:
- racial and socioeconomic barriers to education across the county
- Reassignment programs across the country

Objectives
1) Collect economic data within Durham County to determine greatest need
2) Study other school districts’ boundary and application shifts and replicate them according to Durham’s changing population
3) Assess DPS’ “market share”, studying retention rates of students compared to charter and private institutions

Methods
- Family demographic data collected from US Decennial Census and the American Community Survey (2000-2021)
- These databases include 578,000 geographic areas and 20,000+ variables
- Simplified data into population, ethnicity, poverty, and English proficiency variables
- Referring to other school districts, we replicated poverty indices that aggregated variables through principal component analysis (PCA)
- Lastly, we calculated the ratio of students enrolled in DPS, Charter, and Private schools to get the market share of DPS students in Durham County for tracts, block groups, DPS planning units and school boundaries

Results
(1.) We generated 3 indices of our variables using PCA, each containing 5 unique variables
- Collected from Wake County, NC, Berkeley, CA, and Chicago, IL
- Used regression and K-nearest neighbors to rectify missing data
- Created maps of Durham with our data, we found that each index showed a similar gradient in the tracts

(2.) We moved on to calculating market share
- DPS market share varied across Durham County
- There is a higher number of private school students in West Durham, while more charter school students in East and North Durham

Conclusion
Using these indices and data, DPS can make informed decisions on their school choice requirements and school boundaries. This data will be available in the future when further adjustments are needed.
Future work will include creating regression models that provide the factors in determining public school market share.